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(71) Applicant: **Sarnoff Corporation**
Princeton, NJ 08540-6449 (US)

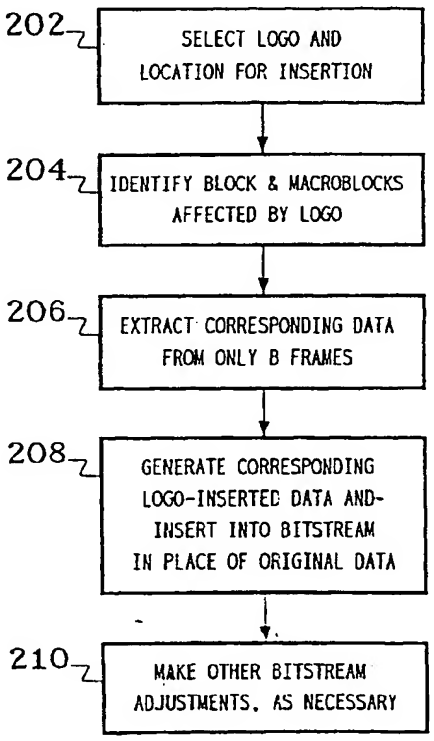
(72) Inventors:
- **Florencio, Dinei Afonso Ferreira**
  Redmond, WA (US)
- **Jonsson, Ragnar Hlynur**
  112 Reykjavik (IS)

(74) Representative: **Atkinson, Ralph et al**
Atkinson & Co.,
The Technology Park,
Shirland Lane
Sheffield S9 3PA (GB)

(54) Insertion of a logo in a video signal

(57) When adding logos or other imagery to compressed digital video bitstreams, logos are inserted into only disposable frames. Since disposable frames are never used as references for decoding other frames, the logos can be added without adversely affecting the playback of any other frames. Preferably, the compressed data for disposable-frame macroblocks corresponding to the desired location for logo insertion are extracted from the compressed bitstream and replaced by intra-encoded logo-inserted data. As a result, logos can be inserted into compressed digital video bitstreams without having to completely decode and re-encode the bitstreams, while maintaining the overall quality of the video display.

FIG. 2



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coding techniques with reference to at least one other frame. Unlike P frames, however, a B frame is never used as a reference for encoding another frame. As such, a B frame can be dropped from a video sequence without adversely affecting the playback of other frames; thus, the name disposable.

[0012] Video compression algorithms like MPEG encode video frames based on regions of pixels called blocks and macroblocks. For example, transforms such as the DCT transform are typically applied to (8x8) blocks of pixel data (i.e., either the pixels themselves or motion-compensated inter-frame pixel differences), while motion estimation and motion compensation are typically applied to (16x16) macroblocks of pixels. In motion-compensated inter-frame differencing, for a non-zero motion vector, a macroblock in one frame is encoded with reference to a (16x16) region of another frame that has a location within that frame that is different from the location of the macroblock in the first frame.

[0013] One advantage to the logo insertion scheme of *Figure 1* is that changes to each video frame due to the insertion of the logo are taken into account when the logo-inserted video is compressed by video encoder **110**. For example, changes to the logo areas in both key and predicted frames will be taken into account when motion estimation and motion-compensated differencing are performed during the encoding of both predicted and disposable frames.

[0014] There are, however, a number of drawbacks to this scheme for inserting logos into compressed digital video bitstreams. First of all, the scheme requires expensive equipment to completely decode and then re-encode the video stream. In addition, compression algorithms such as MPEG are lossy algorithms that rely on quantization and other steps that can adversely affect the quality of the decoded video. As such, the additional decoding and re-encoding steps in this scheme will only further diminish the quality of the final decoded video display at the customer.

[0015] The present invention is directed to an alternative scheme for inserting logos and other imagery into compressed digital video bitstreams such as those conforming to an MPEG video compression standard. According to this scheme, a logo is inserted into only disposable frames in the compressed bitstream. Since no other frames are encoded based on disposable frames, the changes to those frames due to the insertion of the logo will not affect the playback of any other frames in the compressed bitstream. Moreover, in preferred embodiments, only the encoded data corresponding to the affected macroblocks in the disposable frame need to be processed. As a result, the present invention provides a scheme for inserting a logo into a compressed digital video bitstream without having to decode completely the entire compressed digital video bitstream at the local broadcaster.

[0016] *Figure 2* shows a flow diagram of the processing involved in inserting logos or other imagery into compressed digital video bitstreams, according to one embodiment of the present invention. After selecting the logo and the desired location for its insertion in the video display (step **202** of *Figure 2*), the blocks and macroblocks in the video display that will be affected by the logo are identified based on the size of the logo and its desired location (step **204**). The encoded data for only the disposable frames in the compressed digital video bitstream that correspond to the identified blocks and macroblocks are then extracted from the bitstream (step **206**) and replaced with corresponding logo-inserted encoded data (step **208**), where the logo-inserted encoded data corresponds to blocks of intra-encoded pixels representing the logo.

[0017] Depending on the particular implementation, there are different ways of generating the logo-inserted encoded data. For example, in some implementations, the logo-inserted encoded data is completely independent of the corresponding encoded data in the original compressed bitstream. In these implementations, the logo effectively replaces the corresponding macroblocks in the disposable frames of the original video display. In other implementations, the logo is blended with the original video data to achieve a more subtle insertion of the logo into the video display. This blending can be implemented at the pixel level or at the transform coefficient level. If at the pixel level, then the corresponding encoded data from the disposable frames need to be decoded all the way to pixels, which may then be blended (e.g., by weighted averaging) with pixels corresponding to the logo to generate blended pixels which are then recompressed to generate the logo-inserted encoded data. This process may require the application of an inverse (e.g., DCT) transform to recover the pixels from the original encoded data as well as the application of the forward transform to generate the logo-inserted encoded data from the blended data. If it is desirable to avoid the processing required by the application of inverse and forward transforms, in alternative implementations, the blending can be applied directly to the transform coefficients (without having to apply the inverse and forward transforms). In any case, the resulting logo-inserted encoded data is inserted back into the compressed bitstream in step **208** in place of the original encoded data that was extracted during step **206**.

[0018] If necessary, other adjustments are also made to the compressed bitstream (step **210**). For example, the replacement of the original encoded data with the logo-inserted encoded data may affect certain characteristics of the bitstream, such as byte alignment or bitrate. Moreover, in some cases, some additional blocks of the original encoded data may have to be dropped or simplified to compensate for insertion of the intra-encoded logo-inserted data, since intra-encoded blocks tend to require more bits to encode than inter-encoded blocks.

[0019] Under the present invention, if the logo boundaries coincide with macroblock boundaries and if the lo-

the compressed digital video bitstream is received by a local broadcaster from a central network and the imagery-inserted compressed bitstream is broadcast by the local broadcaster to its customers.

7. The invention of claim **2**, wherein the imagery-inserted encoded data is intra-encoded data.

8. The invention of claim **1**, wherein the imagery corresponds to a logo.

9. The invention of claim **1**, wherein the compressed digital video bitstream is received by a local broadcaster from a central network and the imagery-inserted compressed bitstream is broadcast by the local broadcaster to its customers.

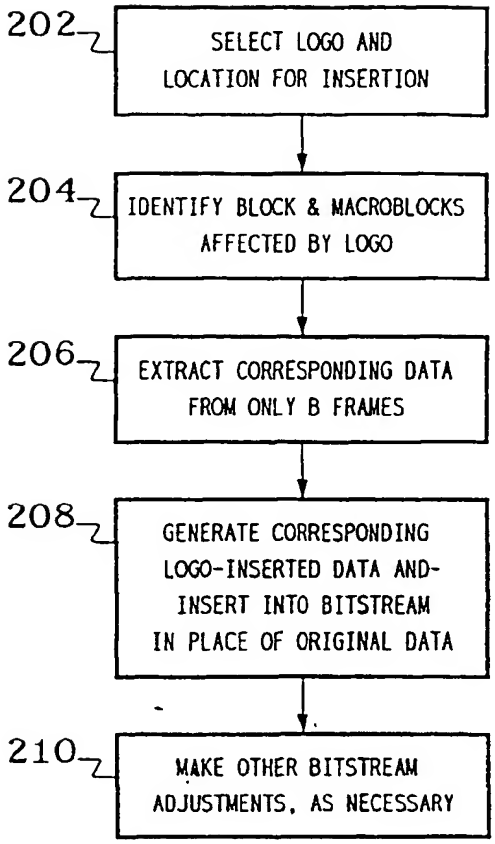
10. An apparatus for inserting imagery into a compressed digital video bitstream, comprising:

(a) means for extracting encoded data from only disposable frames in the compressed digital video bitstream, wherein the encoded data corresponds to a desired location for the imagery; and
(b) means for replacing the extracted encoded data in the compressed digital video bitstream with imagery-inserted encoded data corresponding to the imagery to generate an imagery-inserted compressed bitstream.

11. A computer-readable medium having stored thereon a plurality of instructions, the plurality of instructions including instructions which, when executed by a processor, cause the processor to implement a method for inserting imagery into a compressed digital video bitstream, the method comprising the steps of:

(a) extracting encoded data from only disposable frames in the compressed digital video bitstream, wherein the encoded data corresponds to a desired location for the imagery; and
(b) replacing the extracted encoded data in the compressed digital video bitstream with imagery-inserted encoded data corresponding to the imagery to generate an imagery-inserted compressed bitstream.

FIG. 2



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Princeton, NJ 08540-6449 (US)

(72) Inventors:
- **Florencio, Dinei Afonso Ferreira**
  Redmond, WA (US)
- **Jonsson, Ragnar Hlynur**
  112 Reykjavik (IS)

(74) Representative: **Atkinson, Ralph et al**
Atkinson Burrington
27-29 President Buildings
Firth Way
Sheffield S4 7UR (GB)

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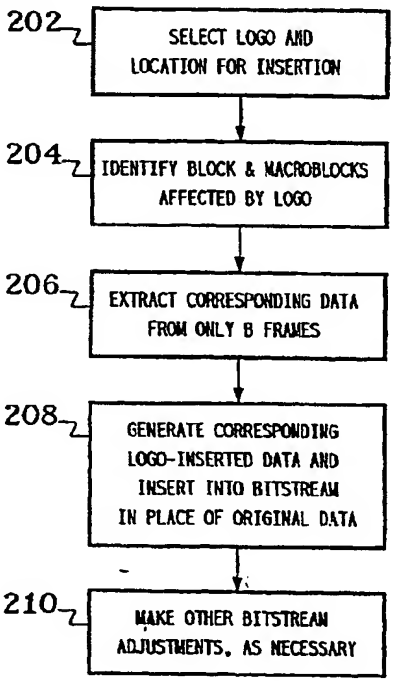
FIG. 2



EP 0 984 633 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 30 5965

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	YOON YUNG LEE ET AL: "VIDEO POST-PRODUCTION WITH CONPRESSES IMAGES" SMPTE JOURNAL,US,SMPTE INC. SCARSDALE, N.Y, vol. 103, no. 2, 1 February 1994 (1994-02-01), pages 76-84, XP000429905 ISSN: 0036-1682 * the whole document * ---	1-3,7,8, 10,11	
A	US 5 761 601 A (JAMES GREG ET AL) 2 June 1998 (1998-06-02) * abstract * * column 11, line 4 - line 12; figure 3 * -----	6,9	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19 February 2001	Beaudet, J-P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

EUROPEAN PATENT OFFICE

Patent Abstracts of Japan

PUBLICATION NUMBER : ~~11298857~~
PUBLICATION DATE : 29-10-99

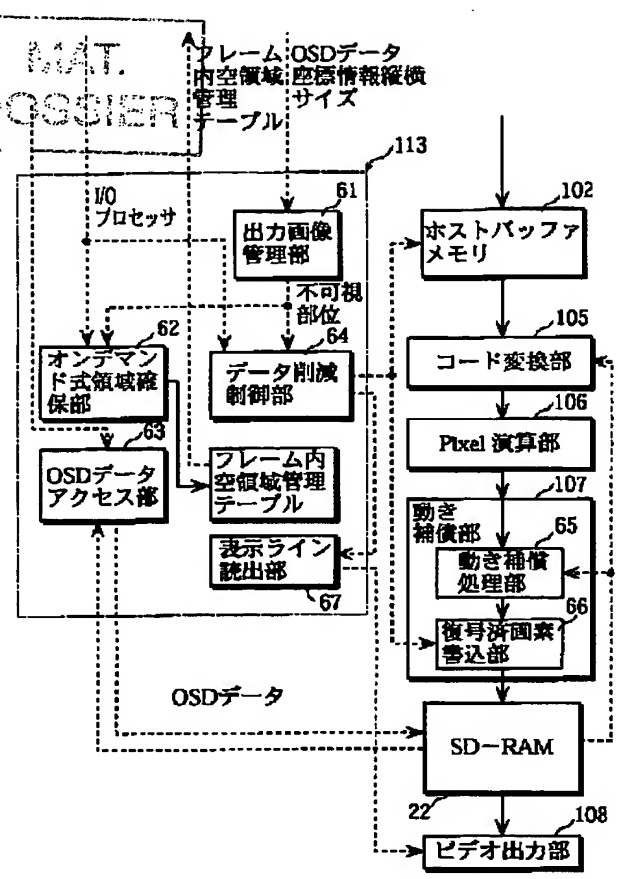
APPLICATION DATE : 12-02-99
APPLICATION NUMBER : 11035010

APPLICANT : MATSUSHITA ELECTRIC IND CO LTD;

INVENTOR : NISHIDA HIDESHI;

INT.CL. : H04N 5/92 H04N 7/24 H04N 9/804 H04N 9/808 H04N 11/04

TITLE : IMAGE DECODER DECODING IMAGE TO ALLOW FRAME AREA OF SHARING MUCH AREA IN STORAGE DEVICE TO BE USED FOR OTHER PURPOSE AND COMPUTER READABLE RECORDING MEDIUM RECORDING IMAGE DECODING PROGRAM



ABSTRACT : PROBLEM TO BE SOLVED: To obtain an image decoder where work areas to store various data such as OSD data are reserved in a memory without sacrificing image quality.

SOLUTION: When a data reduction control section 64 receives a request to reserve storage areas for OSD data, the control section 64 aborts macro blocks equivalent to prescribed addresses of a display image. An OSD data access section 63 writes the OSD data to areas of a frame storage device where the aborted macro blocks have been stored. Since the areas equivalent to prescribed addresses of the display image in the frame storage device are assigned to the OSD data storage area only when reservation of the storage areas for the OSD data is requested, no image quality is deteriorated.

EUROPEAN PATENT OFFICE

Patent Abstracts of Japan

PUBLICATION NUMBER : 11155147
PUBLICATION DATE : 08-06-99

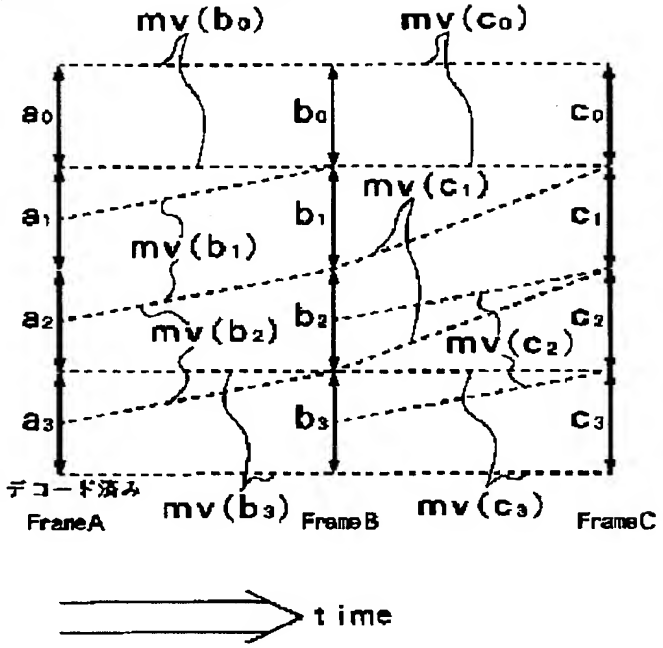
APPLICATION DATE : 18-09-98
APPLICATION NUMBER : 10265395

APPLICANT : CASIO COMPUT CO LTD;

INVENTOR : MATSUI SHINICHI;

INT.CL. : H04N 7/32 H04N 5/92 H04N 5/937

TITLE : IMAGE REPRODUCTION METHOD, IMAGE CODER, AND IMAGE CODING METHOD



ABSTRACT : PROBLEM TO BE SOLVED: To provide a image reproduction method in which the arithmetic operation of each block in a frame is devised to properly omit it, so as to reduce the arithmetic amount and coding and decoding of a bit stream executed at high speed by the communication media use coding algorithm, and to provided the image coding method and the image coder.

SOLUTION: First, all blocks that are not referenced from any block in a Frame C are detected from among blocks of a Frame B (figure shows only a block b_1), based on motion vectors $mv(C_0)$-$mv(C_3)$ resulting from decoding all motion vectors that reference the Frame B to be skipped, an IDCT arithmetic operation to the detected blocks is omitted so as to reduce the arithmetic amount. In an example shown in the figure, the IDCT arithmetic operation required for four blocks in the Frame B and four blocks in the Frame C substantially is reduced to 7 blocks by omitting the IDCT arithmetic operation with respect to the block b_1.